

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MSc
BRANCH: CHEMISTRY

SEMESTER : I
SESSION : MO/18

SUBJECT: CH401 BASIC INORGANIC CHEMISTRY

TIME: 3.00 HRS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
-

- Q.1(a) Justify the position of CO in the Spectrochemical Series by molecular Orbital Theory. [4]
Q.1(b) From the LCAO-MO treatment find the expression of the bonding and anti bonding Molecular Orbitals of diatomic hydrogen molecular ion [6]
- Q.2(a) Find the potential at any point in space in an octahedral field. [5]
Q.2(b) Draw a scheme for the gradual conversion of an octahedral crystal field to square planar geometry. [5]
- Q.3(a) The exchange in the $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ is very much slower than in $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{Fe}(\text{CN})_6]^{4-}$ system. Explain. [3]
Q.3(b) Discuss racemization in the light of Ray and Dutta twist mechanism. [3]
Q.3(c) For Acid hydrolysis of Co(III) complex, increase in chelation cause a decrease in reaction rate. Explain. [4]
- Q.4(a) Draw the Orgel diagram for the following electronic configuration and show the possible electronic transitions: Octahedral - d^3 , Tetrahedral- d^9 [4]
Q.4(b) A 1st row transition metal ion has 45 microstates. Identify the ion and systematically arrange all the microstates in order of increasing energy. [6]
- Q.5(a) State and prove the selection rule for vibronic transition. [4]
Q.5(b) Absorption spectrum of $\text{Ru}(\text{phen})_3(\text{PF}_6)_2$ possesses a moderately strong band - 450 nm. Explain the nature and origin of the band by Molecular Orbital diagram. (phen = 1,10 phenanthroline) [6]

:::::28/11/2018:::::M